We Claim

1. A DNA molecule that encodes a naturally occurring glyphosate resistant EPSPS enzyme derived from a glyphosate tolerant plant, wherein the glyphosate resistant EPSPS enzyme has a K_m for phosphoenolpyruvate (PEP) of less than 10 μM.

2. A DNA molecule of claim 1 that encodes a naturally occurring glyphosate resistant EPSPS enzyme derived from a glyphosate tolerant plant, wherein the glyphosate resistant EPSPS enzyme has a K_m for PEP of less than 10 μM and the K_m for PEP is not more than about twice of the K_m for PEP of a naturally occurring glyphosate sensitive EPSPS enzyme derived from a glyphosate sensitive plant.

3. A DNA molecule of claim 2, wherein said plant is *Eleusine* species.

4. A DNA molecule of claim 1, wherein said naturally occurring glyphosate resistant EPSPS enzyme is modified by a substitution or a deletion of at least one amino acid in a catalytic domain.

5. A DNA molecule of claim 4, wherein said substitution is selected from the group consisting of glycine to alanine 102 and threonine to isoleucine 103 of SEQ ID NO:7.

6. A DNA molecule that encodes a naturally occurring glyphosate resistant EPSPS enzyme of SEQ ID NO:7.

7. A DNA molecule of claim 6 that encodes a naturally occurring glyphosate resistant EPSPS enzyme of SEQ ID NO:7, wherein the DNA molecule is substantially homologous to SEQ ID NO:6.

8. A recombinant DNA molecule comprising: a promoter that functions in plant cells to cause the production of an RNA sequence, operably linked to; a structural DNA sequence that causes the production of an RNA sequence that encodes an EPSPS enzyme comprising the sequence of SEQ ID NO:7, operably linked to; a 3' non-translated region that functions in plant cells to cause the addition of polyadenyl nucleotides to the 3'end of the RNA sequence, wherein the promoter is heterologous with respect to the structural DNA sequence and selected so as to cause sufficient expression of the polypeptide to enhance the glyphosate tolerance of a transgenic plant cell containing said recombinant DNA molecule.

9. A recombinant DNA molecule of claim 8, wherein said structural DNA sequence encodes a fusion polypeptide comprising an amino-terminal chloroplast transit peptide and an EPSPS enzyme comprising the sequence of SEQ ID NO:7.

10. A method of producing glyphosate tolerant plants comprising the steps of:

a) inserting into the genome of a plant cell a recombinant DNA molecule comprising: a promoter that functions in plant cells to cause the production of a RNA sequence, operably linked to; a structural DNA sequence that caused the production of a RNA sequence that encodes an EPSPS enzyme having the sequence of SEQ ID NO:7, operably linked to; a 3' non-translated region that functions in plant cells to cause the addition of polyadenyl nucleotides the 3'end of the RNA sequence; where the promoter is heterologous with respect to the structural DNA sequence and adapted to cause sufficient expression of the polypeptide to enhance the glyphosate tolerance of a plant cell transformed with the DNA molecule;

b) obtaining a transformed plant cell; and

c) regenerating from the transformed plant cell a genetically transformed plant which has increased tolerance to glyphosate herbicide.

11. A method of claim 10, wherein the structural DNA sequence encodes a fusion polypeptide comprising an amino-terminal chloroplast transit peptide and an EPSPS enzyme comprising the sequence of SEQ ID NO:7.

12. A glyphosate tolerant plant cell comprising a recombinant DNA molecule of claim 8 or 9.

13. A glyphosate tolerant plant cell of claim 12 selected from the group consisting of corn, wheat, rice, millet, sugarcane, barley, oat, rye, turf grasses, asparagus, soybean, cotton, sugar beet, oilseed rape, canola, flax, sunflower, potato, tobacco, tomato, alfalfa, forest trees, fruit trees, ornamental annuals, and ornamental perennials.

14. A glyphosate tolerant plant comprising the plant cells of claim 12.

15. A glyphosate tolerant plant of claim 14 selected from the group consisting of corn, wheat, rice, millet, sugarcane, barley, oat, rye, turf grasses, asparagus, soybean, cotton, sugar beet, oilseed rape, canola, flax, sunflower, potato, tobacco, tomato, alfalfa, forest trees, fruit trees, ornamental annuals, and ornamental perennials.

16. A recombinant DNA molecule comprising: a promoter that functions in plant cells to cause the production of an RNA sequence, operably linked to; a structural DNA sequence that causes the production of an RNA sequence which encodes an EPSPS enzyme having the sequence of SEQ ID NO:7, operably linked to; a 3' non-translated region that functions in plant cells to cause the addition of polyadenyl nucleotides the 3' end of the RNA sequence, wherein the promoter is homologous with respect to the structural DNA sequence.

17. A DNA molecule of claim 16 wherein the structural DNA sequence encodes a fusion polypeptide comprising an amino-terminal chloroplast transit peptide and the EPSPS enzyme comprising the sequence of SEQ ID NO:7.

18. A glyphosate tolerant transgenic plant cell comprising a DNA molecule of claim 16 or 17.

19. A glyphosate tolerant transgenic plant cell of claim 18 selected from the group consisting of corn, wheat, rice, millet, sugarcane, barley, oat, rye, turf grasses, asparagus, soybean, cotton, sugar beet, oilseed rape, canola, flax, sunflower, potato, tobacco, tomato, alfalfa, forest trees, fruit trees, ornamental annuals, ornamental perennials.

20. A glyphosate tolerant transgenic plant comprising plant cells of claim 18.

21. Glyphosate tolerant transgenic plant of claim 20 selected from the group consisting of corn, wheat, rice, millet, sugarcane, barley, oat, rye, turf grasses, asparagus, soybean, cotton, sugar beet, oilseed rape, canola, flax, sunflower, potato, tobacco, tomato, alfalfa, forest trees, fruit trees, ornamental annuals, ornamental perennials.

22. The seed of a glyphosate tolerant transgenic plant of claim 15.

23. The seed of a glyphosate tolerant transgenic plant of claim 21.

24. A DNA molecule comprising the promoter region located 5' to the DNA molecule of claim 3.

25. A DNA molecule comprising the chloroplast transit peptide coding region located 5' to the DNA molecule of claim 3.

26. A DNA molecule comprising the 3' untranslated region located 3' to the DNA molecule of claim 3.